SDSU Extension

iGrow Wheat

BEST MANAGEMENT PRACTICES

Chapter 32:
On-Farm Research Protocols

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The widespread use of yield monitors and global position systems (GPS) provides the opportunity for on-farm research. On-farm studies can investigate questions ranging from fungicides to seeding rates. Similar protocols can be used for a wide variety of questions. This chapter provides research protocols for: 1) site-specific seed population, and 2) site-specific optimum phosphorous application.

Protocol for site-specific seeding rates

The purpose of this section is to provide research protocols for site-specific seeding rates. This protocol is designed to help address the increasing cost of seed, the variable response of different seed populations across the landscape, and the significant change in genetic yield potential of newly developed wheat varieties.

A grower with a variable rate planter and yield monitor GPS-equipped combine will plant ½-mile strips (field length of width greater than the combine header) at 600,000, 900,000, 1,200,000, and 1,500,000 seeds/acre (13.8, 20.7, 27.5, and 34.4 seeds/ft^2). The width of the strips must be wide enough to insure that at least one "pure" combine pass is contained within each strip. "Loads" should be used in the yield monitor to identify each pure planting rate combine pass. Strips should be planted as shown in Figure 32.1.

Grower requirements

1. Apply at least three complete sets of alternating strips of the four rates across the length of the field. Document cultural practices such as planting date, variety, condition of seed bed, etc. If three producers are interested in collaborating, each producer can apply one set of strips.

2. Except for the planting population, uniform applications of inputs should be maintained.

3. Accurately record the (A-B) beginning and ending latitude and longitude points of each strip. If rows are not straight (not planted on an A-B line with an autosteer), an agronomy professional should walk the strip centers with a recording GPS receiver.

4. The trial must be harvested with a data recording, GPS-equipped combine. The yield monitor must have been recently calibrated for the variety of wheat in the trial. Harvest the entire trial area on the same day. Each pass should be recorded as a unique load. Combine direction of travel should be the same for all strips within a set. To accomplish analysis, the GPS yield monitor data should be submitted to the SDSU Drought Center as raw yield data from the memory card.

5. Allow the SDSU Drought Center to use submitted and collected data for research, educational, and informational purposes.

6. If it is possible, provide the SDSU Drought Center with production records as well as yield monitor data for the previous five years.

7. Document as much auxiliary information as is possible (precipitation, weed, insect, disease problems, soil test analysis, etc.).

SDSU Drought Center responsibilities

1. Return a report analyzing the treatment differences to include an optimized planting algorithm.

2. Keep data in a confidential manner that can't be linked back to the individual producer by other parties. Only resultant recommendations composited with all data sets will be made public.

3. Take stand counts in each strip.

Figure 32.1. Field protocols for the four field population rates.

Protocol for determining optimum site-specific phosphorous rates

The purpose of this section is to quantify the agronomic and economic impacts of on-the-go changes to phosphorous fertilization. This information is needed to increase profitability. After the initial fertilizer application, the field will be yield monitored for five years with the goal of determining the optimum long-term soil test level.

Brief summary

A field with a low phosphorous soil test level (Olson P of ~5ppm) will be selected. Previous five years of yield monitor data will be used to select (SDSU Drought Center) strip locations. Strips will be laid out on a ½-mile length of field in a width that is equal to the local fertilizer supplier's applicator. Strips will be fertilized perpendicular to the field variability.

Treatments will be:

1. 500 lb of actual P_2O_5/Acre *(if DAP is applied, 18-46-0, this will be 1087 lb DAP/acre—after application soil test ~30)*.

2. 300 lb of actual P_2O_5/Acre (*652 lb DAP/acre*—after application soil test ~20).

3. 100 lb of actual P_2O_5/Acre (*217 lb DAP*—after application soil test ~10).

4. 0 lb (control) of actual P_2O_5/Acre.

Harvesting with a GPS yield monitor, data logging-equipped combine must ensure at least one "pure" combine pass (not mixing yields from two strips) within each strip. Loads should be used in the yield monitor to identify each pure rate pass.

Grower requirements

Apply three sets of the four P rates across the length of the field. If three producers are interested in collaborating, each producer can apply one set of strips. Each year, document the cultural practices such as planting date, hybrid, condition of seed bed, etc. This experiment is designed to last five years.

The major requirements are listed as follows:

1. Apply at least three complete sets of alternating strips of the four rates across the length of the field. Document cultural practices such as planting date, variety, condition of seed bed, etc. If three producers are interested in collaborating, each producer can apply one set of strips.

2. Except for the planting population, uniform applications of inputs should be maintained.

3. Accurately record the (A-B) beginning and ending latitude and longitude points of each strip. If rows are not straight (not planted on an A-B line with an autosteer), an agronomy professional should walk the strip centers with a recording GPS receiver.

4. The trial must be harvested with a data recording, GPS-equipped combine. The yield monitor must have been recently calibrated for the variety of wheat in the trial. Harvest the entire trial area on the same day. Each pass should be recorded as a unique load. Combine direction of travel should be the same for all strips within a set. To accomplish analysis, the GPS yield monitor data should be submitted to the SDSU Drought Center as raw yield data from the memory card.

5. Allow the SDSU Drought Center to use submitted and collected data for research, educational, and informational purposes.

6. If it is possible, provide the SDSU Drought Center with production records as well as yield monitor data for the previous five years.

7. Document as much auxiliary information as is possible (precipitation, weed, insect, disease problems, soil test analysis, etc.).

8. Accurately record the (A-B) beginning and ending end points of each strip. If rows are not straight (not applied on an A-B line with an auto steer), an agronomy professional will walk the strip centers with a recording GPS receiver.

9. 0-6 inch soil sample taken and analyzed for each strip approximately every 400 ft in each ½-mile strip (starting 200 ft from field beginning) before treatment and in years 2, 3,4, and 5. (If 400-ft sample is on side slope and the next 400-ft sample is on the other side of the slope, sample point can be move to the top or bottom of the hill. Mark points with GPS).

10. Fifteen cores (cores to be composited) need to be pulled within 20 ft of each 400-ft flag.

11. Strips must be the width of spreader booms (commonly 70 ft).

12. Fields should be of low phosphorous fertility (Olson or Bray ~5 or less) and without a manure application history.

13. In the following years, the producer's normal flat rate of fertilizer should be applied and documented (normal rate of what producer uses). Soil tests for phosphorus must be pulled every year on strips.

14. Use the same lab every year to do analysis.

15. Record and archive yield data all five years of study.

16. Seeding rate should remain constant across the entire variable rate P study.

SDSU Drought Center responsibilities

1. Return a report analyzing the treatment differences.

2. Keep data in a confidential manner that can't be linked back to the individual producer by other parties. Only resultant state-wide or area-wide recommendations will be made public.

Figure 32.2. Field treatment for the four P rates.

Additional information and references

http://www.agry.purdue.edu/ext/ofr/protocols.html

http://www.agry.purdue.edu/ext/ofr/protocols/PurdueCornFungicideProtocol.pdf

http://york.unl.edu/c/document_library/get_file?uuid=11797937-554d-4142-b8d8-9c59e7d9fb0a&groupId=135081&.pdf

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Carlson, C.G. 2012. On-farm research protocols. In Clay, D.E., C.G. Carlson, and K. Dalsted (eds). iGrow Wheat: Best Management Practices for Wheat Production. South Dakota State University, SDSU Extension, Brookings, SD.